USING ARTIFICIAL ENVIRONMENTS TO REVEAL ADAPTIVE RESPONSES OF ALFALFA LANDRACES ACROSS NORTHERN ITALY

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Previous work showed that genotype x location interaction for dry matter (DM) yield of alfalfa (Medicago sativa L. subsp. sativa) cultivars in northern Italy is large and associated with soil type and level of summer drought stress of locations. Thirteen farm landraces collected across the region, and four control varieties of known adaptation pattern, were evaluated for DM yield in four artificial environments created at one site by the factorial combination of soil type (sandy-loam or silty-clay) and drought stress level (almost nil or high), for: i) exploring the possibility to reproduce in artificial environments the adaptation patterns occurring across the region; ii) investigating the adaptation pattern of landraces and its relationship with environmental factors at collecting sites. Cultivars varied largely for adaptation pattern across the artificial environments mainly due to cultivar x stress interaction. The Additive Main effects and Multiplicative Interaction-modelled responses of control cultivars successfully reproduced those observed across locations, candidating the artificial environments as a cheaper alternative to more test locations when evaluating genetic resources or breeding for wide or specific adaptation. Better response to stress conditions of landraces was closely associated with the level of summer drought at collecting sites ($r = 0.82$), highlighting the importance of evolutionary adaptation in this context. Although there is large evidence of landrace material specifically adapted to drought-stress environments, this study indicates that landraces may also be specifically adapted to favorable conditions, provided that they evolved under such conditions. The agronomic value of these genetic resources cannot reliably be assessed in only one environment, as it may be largely underestimated in the presence of drought stress levels that contrasts with those of the environment of origin. Several landraces showed an agronomic value comparable with, or even superior to, that of improved varieties, confirming their interest as genetic base for local breeding programs.